INSTRUCTION MANUAL

DIGITAL MULTIMETER MM 200

DE FOREST
ELECTRONICS

DE FOREST MM200

MULTIMETER

INSTRUCTION MANUAL

#6705-0155
REV LEVEL 2

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ADDENUM

ONLY FOR UNITS WITHOUT AC-BAT SWITCH

Page 2, 3, 12 (3.4c) & 15 (3.11g)

Instead of INT SW SET TO BAT, jumper should be placed between two adjacent holes marked BAT.

Instead of INT SW SET TO AC: No jumper

CHAPTER 1

INTRODUCTION

The new DE FOREST MM200 Digital Multimeter is a precision, wide range, multi-purpose instrument capable of measuring: DC voltage 0-1000V; AC voltage 0-700V; DC current 0-1A; AC current 0-1A, each in four ranges and resistance 0-19.99 megohm, in five ranges with automatic polarity indicator. The LED display will read up to a magnitude of 1999, (3½ digit). If the reading is higher than 1999, the overload circuit will display a flashing equal sign on the most significant digit and zeros on the other digits.

The Multimeter can be powered in two ways:

1. Internal 6 V lead acid battery (optional) - The two battery leads should be connected to the battery, red wire to the + terminal and black wire to the - terminal, internal switch set to battery. The AC-DC converter will charge the battery overnight for day time service.

   A 16 hour charge is sufficient to give 8 hours of continuous service. During the charge the instrument should be switched off, otherwise the power consumption of the circuit will give a much lower charging rate.

   When the battery approaches full charge, a special charging circuit will automatically switch over to a low trickle current to prevent battery damage due to overcharging.

2. 120V AC - Battery leads should be connected to the spade contacts on the board. Red wire to contact marked + and black wire to - . Internal switch set to AC. The AC-DC converter will supply now a constant 6V to the circuit.

Although the circuit is well protected from over-voltage, caution should be exercised by selecting the proper function setting.

The shunt resistors for the current measurements are protected by a 1A fuse.

If the MM200 is in the resistance measurement mode, the circuit is protected by a 5mA fuse. When a voltage of more than 6 volts is accidentally connected to the Multimeter inputs, the fuse will protect the instrument.

CAUTION: DO NOT measure resistance of 5mA fuse with Analog meter.

NOTE: The very high input impedance of the 1V DC mode will prevent the instrument to return to zero if the input leads are open circuited, this does not indicate a fault condition for zero adjust the leads should be shorted.

SPECIFICATIONS

NOTE: The indicated accuracy is in percent of reading.

DC VOLTS

RANGE	ACCURACY %	DIGIT	INPUT IMPEDANCE	RESOLUTION	MAX OVERLOAD
0 - 1.999V	0.3	±1	10M ohm	1 mV	350V
0 - 19.99V	0.5	±1	10M ohm	10 mV	1000V
0 - 199.9V	0.5	±1	10M ohm	100 mV	1000V
0 - 1000V	0.5	±1	10M ohm	1 V	1000V

NOTE: In AC Mode, the indicated accuracy is in percent of reading if reading is more than 1/10 of full scale.

AC VOLTS

						FREQ. RANGE
0 - 1.999V	0.7	±2	10M ohm/40pF	1 mV	200V	20Hz-1kHz
0 - 19.99V	1.0	±2	10M ohm/40pF	10 mV	500V	20Hz-1kHz
0 - 199.9V	1.0	±2	10M ohm/40pF	100 mV	500V	20Hz-1kHz
0 - 500V	1.0	±2	10M ohm/40pF	1 V	500V	20Hz-1kHz

SPECIFICATIONS

DC CURRENT

RANGE	ACCURACY % DIGIT		IMPEDANCE	RESOLUTION	MAX OVERLOAD
0 - 1.999mA	0.5	±1	1K ohm	1 uA	1A(Fused)
0 - 19.99mA	0.5	±1	100 ohm	10 uA	1A(Fused)
0 - 199.9mA	0.5	±1	10 ohm	100 uA	1A(Fused)
0 - 1000mA	1.0	±1	1 ohm	1 mA	1A(Fused)

AC CURRENT

						FREQ. RANGE
0 - 1.999mA	1.0	±2	1K ohm	1 uA	1A(Fused)	20Hz-1kHz
0 - 19.99mA	1.0	±2	100 ohm	10 uA	1A(Fused)	20Hz-1kHz
0 - 199.9mA	1.0	±2	10 ohm	100 uA	1A(Fused)	20Hz-1kHz
0 - 1000mA	2.0	±2	1 ohm	1 mA	1A(Fused)	20Hz-1kHz

SPECIFICATIONS

RESISTANCE

RANGE OHMS	ACCURACY % DIGIT		MEASURING CURRENT	RESOLUTION OHMS	OVERLOAD PROTECTION
0 - 1.999K	1.0	±1	1 mA	1	5 mA(Fused)
0 - 19.99K	1.0	±1	100 uA	10	5 mA(Fused)
0 - 199.9K	1.0	±1	10 uA	100	5 mA(Fused)
0 - 1999K	1.0	±1	1 uA	1K	5 mA(Fused)
0 - 19.99M	5.0	±1	0.1 uA	10K	5 mA(Fused)

er:

Internal battery 6V or 120V AC via AC-DC converter. (Converter can also be used to charge the battery.)

Input Terminals Polarity:

A positive voltage to the Red terminal with respect to the Black will give a positive reading.

In resistance mode, the Red terminal is positive.

Functions:

The MM200 will measure AC and DC volts. AC and DC current and resistance.

Range:

The four range multipliers 1, 10, 100 and 1000 are selected by pressing the appropriate button - the decimal point will be automatically positioned.

In the 0 - 19.99M ohm range ALL the range buttons are in the released position which can be accomplished by depressing slightly one of the released range buttons until it releases the latch of the depressed button, without latching itself. The reading of the display in K ohm must be multiplied by 10, or divided by 100 for a M ohm reading.

Reading rate:

2.5 per second.

Readout height:

0.3 inc.

Temperature Coefficients:

DC ranges	0.03% per C
AC ranges	0.05% per C
Resistance ranges	0.05% per C

Operating Temperature:

0 C to 50 C

Current Consumption:

100mA approximately

Size:

Height	3.4"	8.6 cm
Width	10.0"	25.4 cm
Depth	12.0"	30.5 cm

(Including knobs, feet and handle.)

Weight:

With battery	3.0 lbs.	1.36 kg
Without battery	2.13 lbs.	0.96 kg

CHAPTER 2

OPERATING CONTROLS

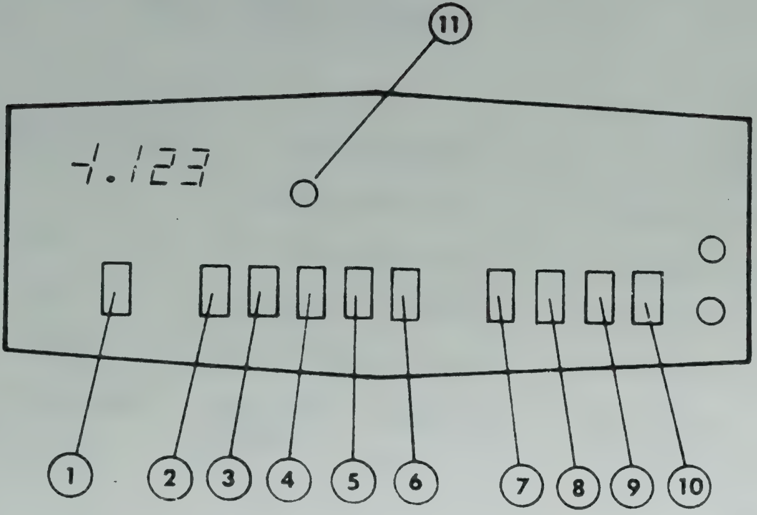

FIGURE 2-1

FRONT PANEL CONTROLS

TABLE 2-1

FRONT PANEL CONTROLS

INDEX NO.	DESIGNATION	DESCRIPTION	FUNCTION
1	Push on	Power switch	Controls power to unit
2	V AC	AC volts function switch	AC volts measurements
3	mA AC	AC mA function switch	AC current measurements
4	V DC	DC volts function switch	DC volts measurements
5	mA DC	DC mA function switch	DC current measurements
6	k ohms	Kilo ohm function switch	Kilo ohms resistance measurements

TABLE 2-1
FRONT PANEL CONTROLS
(Continued)

INDEX NO.	DESIGNATION	DESCRIPTION	FUNCTION
7	1	1 range switch	Display from 0 to 1.999
8	10	10 range switch	Displays from 0 to 19.99
9	100	100 range switch	Displays from 0 to 199.9
10	1000	1000 range switch	Displays from 0 to 1999
11	Set Zero	Set Zero potentiometer	With input leads shorted, display should read 0000 digit on all modes

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CHAPTER

ALIGNMENT PROCEDURE

3.1 INTRODUCTION.

Alignment or repair done by unauthorized persons will void the warranty.

The unit can be opened by removing the four screws on bottom and lifting off bottom cover. See Figure 3-1 for location of alignment pots, test points and fuses.

Calibration of instrument only necessary after repair of the unit. (Replacement of parts except fuses.)

This chapter provides all of the procedures necessary to align and calibrate the DE FOREST MM200 Multimeter.

3.2 POWER SUPPLY ADJUSTMENTS.

3.3a If unit contains an internal battery refer to Paragraph 3.4A and continue.

3.3b If unit does not contain an internal battery refer to Paragraph 3.5A and continue.

3.4a Push power ON/OFF switch to OFF.

3.4b Disconnect battery and connect a 422 ohms 1% resistor between the battery leads.

3.4c Make sure internal AC/BAT switch is set to BAT position.

3.4d Connect a calibrated voltmeter between test point TP8 and ground.

3.4e Connect AC-DC converter to Multimeter and AC outlet.

3.4f Adjust R53 potentiometer for a reading of 7.20 volts.

3.4g Remove battery clips from resistor and connect them to the spade contacts on the printed circuit board, Red to +; Black to - .

3.5a Push power ON/OFF switch to ON.

3.5b Connect calibrated voltmeter between TP8 and ground. Check TP8, 6.1 ±0.2 volts.

3.5c Connect calibrated voltmeter between TP7 and ground. Check TP7, -7.50 ±0.35 volts.

3.6 V DC CALIBRATION AND SET ZERO ADJUSTMENT.

3.7a Push V DC function switch and "1" range switch.

3.7b Short Multimeter input leads.

3.7c Adjust Front Panel SET ZERO potentiometer for a display reading of 0.000.

3.7d Connect a calibrated standard cell (1.018 volt) to Multimeter input connectors. + side of standard cell to RED input connector, and - side of standard cell to BLACK input connector.

3.7e Adjust R29 potentiometer until display reads 1.018.

3.7f Reverse leads to input connectors.

3.7g Adjust R26 potentiometer until display reads -1.018.

3.7h Repeat instructions in Paragraph 3.7b thru 3.7g.

3.7i Disconnect Multimeter input leads.

3.8 RESISTANCE CALIBRATION.

3.9a Push K ohm function switch and "1" range switch.

3.9b Connect a 1 Kilo ohm standard resistor to Multimeter input leads.

3.9c Adjust R12 potentiometer for a display reading of 1.000.

3.9d Disconnect Multimeter input leads.

3.9e Display should read = .000 with equal sign flashing.

3.10 V AC CALIBRATION.

3.11a Push AC function switch and "1" range switch.

3.11b Short input leads adjust R66 until display reads 0.000.

3.11c Connect a Sine Wave Generator to Multimeter input leads. Monitor generator's amplitude with a calibrated AC Voltmeter.

3.11d Adjust generator's frequency control to 100 Hz and set generator's amplitude for a reading of 1.000 volts on calibrated AC Voltmeter.

3.11e Adjust R15 potentiometer on MM200 Multimeter for a display reading of 1.000.

3.11f Push Multimeter's power ON/OFF switch to OFF.

3.11g If unit is used with battery, connect battery and set internal switch to BAT.

Following parts can be ordered from DE FOREST ELECTRONICS:

	Part No.
Battery	2900-2120
120V AC-DC Adaptor Type AD120	1300-0000
220V AC-DC Adaptor Type AD220	1300-0010
Fuse 1A	1100-1700
Fuse 5mA	1100-1600
Test Leads	0906-0660

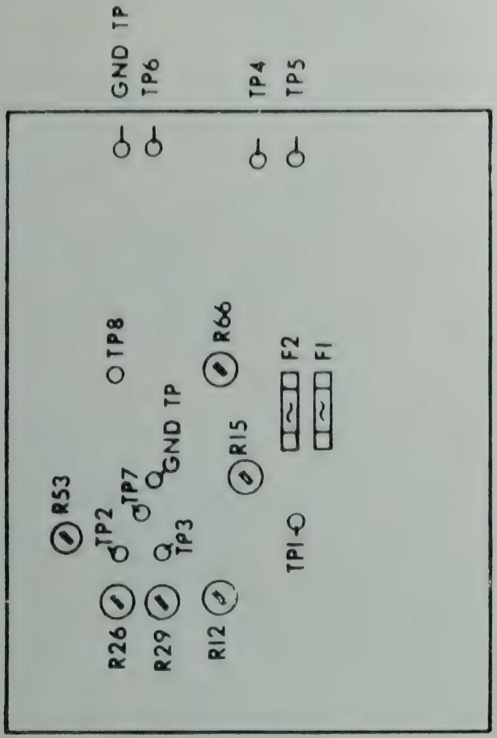


FIGURE 3-1

POTENTIOMETER LOCATION
FOR
DE FOREST MM200 DIGITAL MULTIMETER

WARRANTY

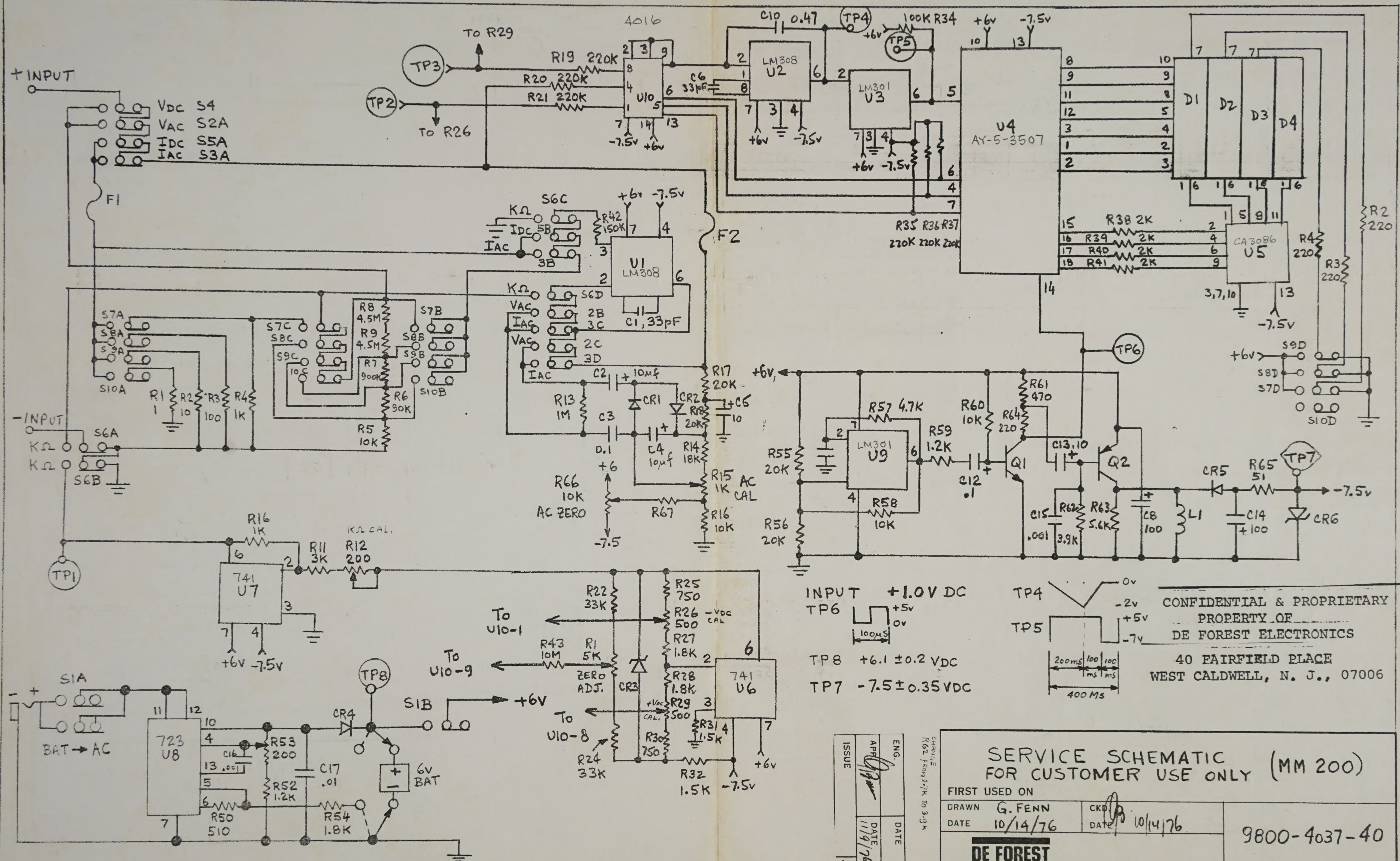
The MM200 Digital Voltmeter is warranted for a period of one year from the purchase date, under normal use, against defective materials and workmanship.

Defective parts will be repaired, adjusted and/or replaced at no charge. When the instrument is returned, prepaid to:

DE FOREST ELECTRONICS
40 FAIRFIELD PLACE
WEST CALDWELL, N.J. 07006

This warranty is void if the instrument has been visibly damaged by accident or misused, or if the instrument has been serviced or modified by an unauthorized person.

NOTE: Battery is not covered by this warranty.



INPUT +1.0V DC

TP8 +6.1 ±0.2 VDC

TP7 -7.5 ± 0.35 VDC

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PROPERTY OF
DE FOREST ELECTRONICS
40 FAIRFIELD PLACE
WEST CALDWELL, N. J., 07006

SERVICE SCHEMATIC
FOR CUSTOMER USE ONLY (MM 200)

FIRST USED ON

DRAWN G. FENN
DATE 10/14/76
CKD
DATE 10/14/76

9800-4037-40

DE FOREST ELECTRONICS

ISSUE	APP	ENG.
2	DATE 11/19/76	DATE

CHANGE R62 FROM 2.7K TO 3.9K